



Clinton Power Station
8401 Power Road
Clinton, IL 61727

U-604119
May 2, 2013

10 CFR 50.73
SRRS 5A.108

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Licensee Event Report 2013-002-00

Enclosed is Licensee Event Report (LER) No. 2013-002-00: Deficient Fuse Causes Main Generator Trip, Turbine Trip and Reactor SCRAM. This report is being submitted in accordance with the requirements of 10 CFR 50.73.

There are no regulatory commitments contained in this report.

Should you have any questions concerning this report, please contact Ms. Kathy Ann Baker, Regulatory Assurance Manager, at (217)-937-2800.

Respectfully,

A handwritten signature in black ink, appearing to read "W. G. Noll", with a small flourish at the end.

William G. Noll
Site Vice President
Clinton Power Station

RSF/blf

Enclosures: Licensee Event Report 2013-002-00

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Office of Nuclear Facility Safety – IEMA Division of Nuclear Safety

NRC FORM 366 (10-2010)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB: NO. 3150-0104		EXPIRES: 10/31/2013																																					
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)																																											
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FACILITY NAME Kathy Ann Baker, Regulatory Assurance Manager						TELEPHONE NUMBER (Include Area Code) 217-937-2800																																					
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT																																											
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX																																		
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) <p>On 3/7/13, at 0756 hours, the main generator tripped followed by a main turbine trip and an automatic reactor SCRAM at 0758 hours. A troubleshooting team was immediately dispatched to investigate the cause of the event and found that a fuse was blown/open on the C phase of the main generator's voltage regulating potential transformer (PT). This fuse is designed to fast blow. A voltage balance relay is installed to sense a fast blow failure and prevent a generator trip. Investigation found that the fuse did not fast blow and instead degraded gradually and did not allow the voltage balance relay to detect a problem, thus the relay did not prevent the main generator trip and subsequent SCRAM. A failure analysis of the fuse identified that the cause of the C phase potential transformer fuse failure was a manufacturing defect in a solder connection in the fuse. The poor solder connection was caused by deficiencies in the manufacturing process. Corrective actions include replacing the fuse that failed with a fuse that was not manufactured at the affected facility. An evaluation is being performed to determine when to inspect and replace the population of other potentially affected fuses.</p>																																											

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CONTINUATION SHEET

U.S. NUCLEAR REGULATORY COMMISSION

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NARRATIVE

PLANT AND SYSTEM IDENTIFICATION

General Electric -- Boiling Water Reactor, 3473 Megawatts Thermal Rated Core Power
Energy Industry Identification System (EIS) codes are identified in test as [XX].

EVENT IDENTIFICATION

Deficient Fuse Causes Main Generator Trip, Turbine Trip and Reactor SCRAM

A. Plant Operating Conditions Before the Event

Unit: 1 Event Date: 3/7/2013 Event Time: 0758 hours CST
Mode: 1 Mode Name: Power Operation Reactor Power: 96.9 percent

B. DESCRIPTION OF EVENT

At 0642 on 3/7/13, the plant was in Mode 1 (Power Operation) at 96.9 percent power. The Main Control Room (MCR) received a main generator [TG] [TB] trouble alarm [ALM] for the Automatic Voltage Regulator (AVR) [EC] automatically transferring from channel 2 to channel 1 due to a fault. Operators verified main generator parameters were normal and dispatched Equipment Operators and Electrical Maintenance technicians to investigate the reason for the fault. The MCR completed pre-emptive briefs to discuss the alarms received and a Reactor Operator was assigned to focus on the main generator and exciter [EXC]. Contingency actions for a turbine trip and reactor SCRAM were also briefed.

At 0756 hours, the main generator tripped. At 0758 hours, Operators in the MCR received numerous alarms for a main turbine [TRB] trip and reactor [RCT] SCRAM. Subsequently, the Reactor Operator placed the reactor mode switch [HS] into the shutdown position. Operators entered the Reactor Scram Off-Normal Procedure and subsequently entered Emergency Operating Procedure (EOP)-1, "Reactor Pressure Vessel Level Control," due to an expected low reactor water level 3 trip signal. All control rods fully inserted and all plant equipment responded as expected to the SCRAM. At 0928 hours, Operators established a reactor coolant pressure of 500 to 600 pounds per square inch gage, using Turbine Bypass Valves, a reactor pressure vessel water level of 30 to 39 inches, and exited EOP-1 in accordance with normal plant procedures.

A troubleshooting team was formed to investigate the cause of the trip. The team determined that the AVR initially transferred from channel 2 to channel 1 due to a degrading potential transformer [XPT] (PT) C phase regulating fuse [FU]. The AVR responded to the fuse degradation by sensing an increase in voltage without sensing the corresponding change in current during the same time period, and the AVR acted as designed in its internal algorithm by automatically switching to the backup channel. However, the PT fuse protecting the C phase to the Main Generator did not function as designed. This fuse is designed to "fast blow" and a voltage balance relay [60] is installed to sense a "fast blow" failure and prevent a generator trip. The troubleshooting team identified that the fuse did not fast blow, and instead degraded gradually which did not allow the voltage balance relay to detect the problem and prevent the main generator trip and subsequent reactor SCRAM.

As expected during the event, the low reactor water level 3 trip signal caused primary containment isolation valves [ISV] in Group 2 (Residual Heat Removal (RHR) [BC]), Group 3 (RHR), and Group 20 (miscellaneous systems) to receive signals to shut; operators verified that the valves properly responded to the trip signal.

This event was determined to be reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A), as a event or condition that resulted in automatic actuation of the reactor protection system (RPS). At 1052 hours, the

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NARRATIVE

station notified the NRC of this event via Emergency Notification 48812. Issue Report 1484624 was initiated to investigate this event.

C. CAUSE OF EVENT

A failure analysis of the fuse identified that the cause of the C phase PT fuse failure was a manufacturing defect in a solder connection in the fuse. As the solder joint failed, the increasing resistance caused a false overvoltage signal, which resulted in the main generator trip followed by a main turbine trip and reactor SCRAM. The deficient solder connection was found to have poor coverage and wetting, which would have resulted in a mechanically weak solder connection. The poor solder connection was caused by deficiencies in Eaton Cutler-Hammer's manufacturing process at the Dominican Republic production facility. A contributing cause for the fuse failure was a misalignment of the stack assembly that increased forces on the solder connection. The internal boric acid block stack assembly end cap was found displaced and angled due to a wedging of the heat shrink wrap under one end of the cap, which resulted in some misalignment of the spring end and element within the assembly.

D. SAFETY CONSEQUENCES

The actuation of the RPS placed the plant in a safe and stable condition. There were no plant safety limits exceeded, and no other Engineered Safety Feature (ESF) actuations, and risk significance was low. Safety related systems functioned correctly in response to this event with critical plant parameters remaining within the bounds of plant design, Technical Specifications, Updated Safety Analysis Report, Offsite Dose Calculation Manual, and Core Operating Limits Report. The affected system (TG system) is non-safety related.

No loss of safety function occurred during this event.

E. CORRECTIVE ACTIONS

The fuse that failed was replaced with a fuse that was not manufactured at the Dominican Republic production facility.

An extent of condition review has been performed to identify other potentially affected installed fuses and a plan is being developed to inspect and replace the affected fuses.

F. PREVIOUS OCCURRENCES

A review for previous occurrences did not identify similar events at Clinton Power Station.

G. COMPONENT FAILURE DATA

Component Description: C Phase Regulating Potential Transformer Fuse
 Manufacturer: Eaton Cutler-Hammer
 Nomenclature: Potential Transformer Fuse
 Model: CLPT
 Manufacturer Part Number: 25CLPT-.5E
 Date of Manufacture Code: 9/2009